

What is claimed is:

1. Process for purification of an acidic monomer having a double bond, comprising the steps

5 (a) providing a starting mixture, containing as starting mixture components, respectively based on the starting mixture,

 (a1) at least 5 wt.% of the acidic monomer and either

 (a2) at least 0.01 wt.% water, or

 (a3) at least 0.01 wt.% of at least one starting mixture component, or

10 (a2) and (a3)

 wherein the sum of the wt.% proportions of the starting mixture components gives respectively 100 wt.%;

 (b) addition of a phase former or a salt of this phase former or a mixture of both to obtain a purification mixture, from which

15 (c) at least one first phase and an at least one further phase distinguished from the first phase by means of a phase boundary form a phase system;

 (d) lowering of the temperature of the phase system; wherein

 (e) in one of the phases of the phase system a product crystal containing at least 50 wt.% of one of the starting mixture components is formed in addition to
20 another starting mixture component as a crystal system;

 (f) isolation of the product crystals.

2. Process according to claim 1, wherein the temperature is only lowered in one phase of the phase system.

- 25 3. Process according to claim 2, wherein the temperature is lowered in the most monomer-rich phase of the phase system.

4. Process according to one of the preceding claims, wherein the acidic monomer has
30 a pH value of less than 7.

5. Process according to one of the preceding claims, wherein the acidic monomer is (meth)acrylic acid.
- 5 6. Process according to one of the previous claims, wherein the phase former is a Brönsted acid with a pH value of less than 6 or a salt of a Brönsted acid or a mixture thereof.
7. Process according to claim 6, wherein the Brönsted acid is sulphuric acid or one of its salts or a mixture thereof.
- 10 8. Process according to one of the preceding claims, wherein the phase former is liquid at the time of addition.
9. Process according to one of the preceding claims, wherein the purification mixture contains the phase former in a quantity in the range from 1 to 80 wt.%, based on the purification mixture.
- 15 10. Process according to one of the preceding claims, wherein at least on part of the phase former is recovered after formation of the phase systems and reused in step (b) of the starting mixture.
- 20 11. Process according to one of the preceding claims, wherein the crystal system or the isolated monomer crystal or both are subjected to at least one further purification step.
- 25 12. Device for synthesis of an acidic monomer (1) having a double bond, having in fluid conducting association as components:
- 30 i. as a monomer synthesis unit (2) having a gas phase monomer synthesis unit (2a) or a liquid phase monomer synthesis unit (2b),
- ii. a quench unit (3) following the gas phase monomer synthesis unit (2a),

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- iii. optionally a first purification unit (4) following the liquid phase monomer synthesis unit (2b) or the quench unit (3),
 - iv. a first extraction unit (5), having as components:
 - (aa) a starting mixture conduit (6) connected to the liquid phase monomer synthesis unit (2b) or to the quench unit (3) or with the optionally available first purification unit (4),
 - (bb) a phase former conduit (7),
 - (cc) an extraction container (8) accommodating the starting mixture conduit (6) and the phase former conduit (7),
 - 10 v. optionally a further extraction unit (9) connected to the first extraction unit (5) or a further purification unit (10) or both.
- 15
13. Device according to claim 12, wherein the gas phase monomer synthesis unit (2a) has at least one reactor (11, 12).
14. Device according to claim 13, wherein at least one of the reactors has a supported transition metal oxide catalyst (13).
- 20 15. Device according to one of claims 13 or 14, wherein at least one of the reactors is a gas phase reactor.
- 25 16. Device according to one of claims 12 to 15 with the first purification unit (4) following the quench unit (3), wherein the first purification unit (4) has a distillation column.
17. Device according to claim 16, wherein the distillation column has a column bottom (14), which is connected to the starting mixture conduit (6).
- 30 18. Device according to claim 17, wherein the distillation column has a column head (15) in its upper portion, which is connected to the starting mixture conduit (6).

19. Device according to one of claims 12 to 18, wherein a cracking device (16) for oligomers of the acidic monomer is attached to the first purification unit (4).
- 5 20. Device according to claim 19, wherein the cracking device (16) has a cracking device bottom (17) in its lower portion, which is connected to the starting mixture conduit (6).
- 10 21. Device according to one of claims 12 to 20 with the first purification unit (4) following the quench unit (3), wherein the first purification unit (4) is a crystal generator.
- 15 22. Process for producing an acidic monomer having a double bond, wherein a synthesis mixture coming out of at least one reactor and containing the acidic monomer and at least one synthesis component is contacted with water and optionally after at least one further workup step is supplied as a starting mixture to a process according to one of claims 1 to 9.
- 20 23. Process according to claim 20, wherein the acidic monomer is obtained in the at least one reactor by oxidation of a hydrocarbon having at least one double bond.
24. Process according to one of claims 20 or 21, wherein a device (1) according to one of claims 12 to 21 is used for carrying out the process.
- 25 25. Acidic monomer obtainable according to a process according to one of claims 22 to 24.
- 30 26. Fibres, formed bodies, films, foams, superabsorbent polymers, special polymers for the areas of waste water treatment, dispersion dyes, cosmetics, textiles, leather finishing or paper producing or hygiene articles, at least based on or containing an acidic monomer according to claim 25.

27. Use of an acidic monomer according to claim 25 in or for producing fibres, formed bodies, films, foams, superabsorbent polymers or hygiene articles, detergents or special polymers for the areas of waste water treatment, dispersion dyes, cosmetics, textiles, leather finishing or paper producing.